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Winter Damage to Ponderosa Pine in Nebraska

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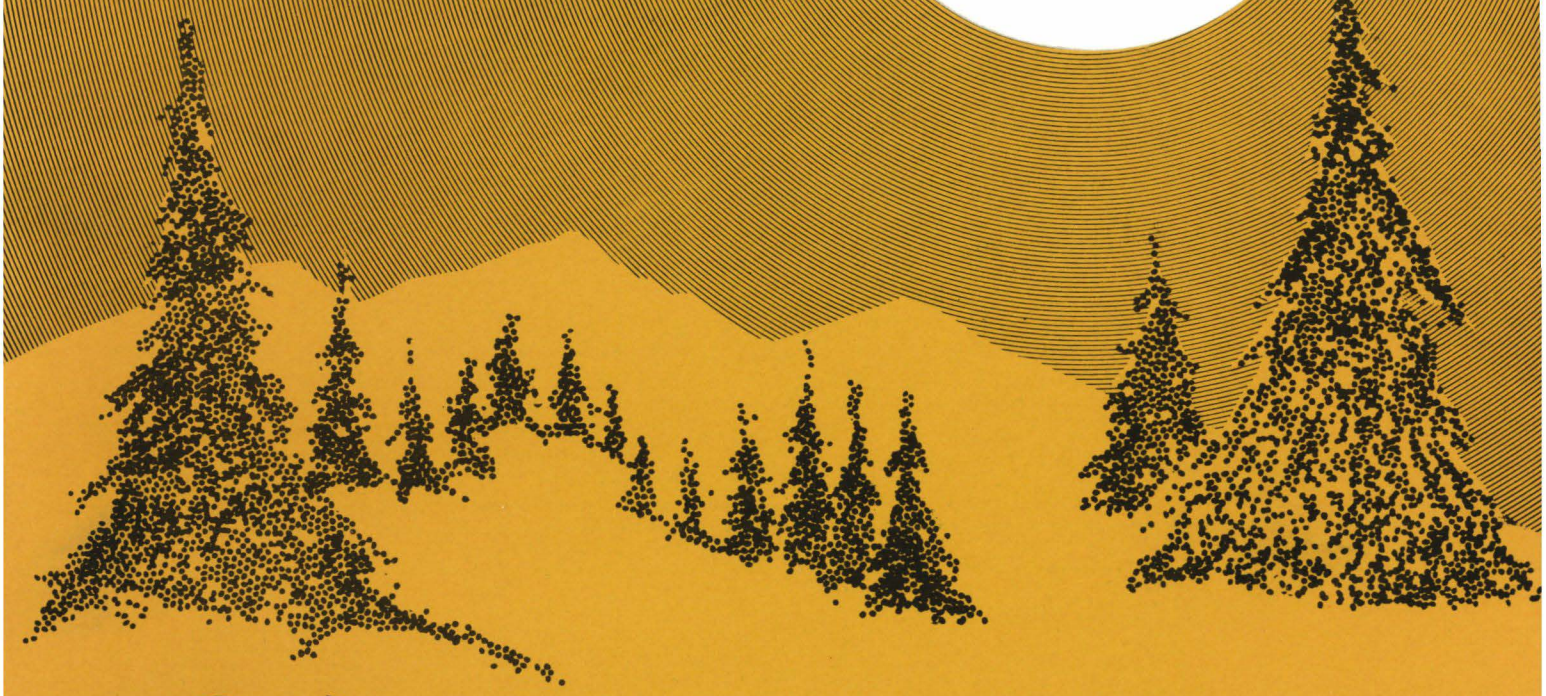

Rocky Mountain Region

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Winter Damage to Ponderosa Pine in Nebraska

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ABSTRACT

An evaluation was conducted to assess damage to ponderosa pine in two areas in Nebraska. Damaged trees were found in northwestern Nebraska within and adjacent to Pine Ridge Ranger District and on the Bessey Ranger District of the Nebraska National Forest in northcentral Nebraska. Needle tip dieback with red foliage was common. Some scattered individual tree mortality was noted. Damaged trees were often attacked by insects. Weather records and general tree symptomatology indicate that damage was probably incited by extremely cold temperatures and winter drying that occurred late in 1978 or early in 1979.

ACKNOWLEDGEMENTS

Field assistance by Warren DuBois, District Ranger, Bessey Ranger District, Nebraska National Forest and John Williams, Upper Niobrara-White Natural Resource District, Nebraska Natural Resources Commission is appreciated. We thank William G. Telfer, South Dakota Forest Pest Specialist, for providing temperature data used in this evaluation.

INTRODUCTION

During the spring of 1979, several requests were received to investigate sudden damage to ponderosa pine throughout portions of central and western Nebraska. Trees of all ages were apparently affected and the problem was serious enough to cause scattered tree mortality. In response to these requests, field and laboratory investigations were conducted by Robert James, Plant Pathologist, to elucidate etiology of the disorder and suggest possible control measures to reduce its impact.

METHODS

Field examinations of damaged trees in two areas of Nebraska were conducted during May 1979. Numerous trees were examined for evidence of insects and pathogens within the Pine Ridge area of northwestern Nebraska near Chadron and Rushville (Dawes and Sheridan Counties). Investigations were also conducted on symptomatic plantation ponderosa pine within the Bessey Ranger District of the Nebraska National Forest. Damaged foliage and twig tissues from the Bessey Ranger District were cultured for presence of pathogenic organisms.

RESULTS AND DISCUSSION

Damaged trees (Fig. 1) displayed red foliage over much of their crown. Red, necrotic needles were concentrated at the branch tips and usually limited to the current year's growth (Fig. 1). Discoloration and necrosis was apparently initiated at needle tips and progressed toward the fasicle sheaths (Fig. 2). Older foliage located within the tree crown was usually undamaged. More trees were affected on open sites unprotected from prevailing winds. None of the cultured needle and twig samples yielded pathogenic fungi.

Mortality was not common within the examined stands. Most of the few trees killed were infested by the Zimmerman pine moth (*Dioryctria zimmermani* (Grote'). This insect caused extensive damage to the main stem at the nodes of young plantation trees. Affected trees often had many broken branches at the point of larval activity. Insect infestation had occurred prior to and was not related with needle damage.

FIGURE 1. Winter damaged ponderosa pine on the Bessey Ranger District, Nebraska National Forest.

FIGURE 2. Patterns of needle discoloration and necrosis on winter damaged ponderosa pine.

Absence of pathogenic organisms, patterns of needle discoloration, and distribution of symptomatic trees strongly implicates adverse weather as the primary cause of damage. Weather records collected from Rapid City, South Dakota (about 100-200 miles from affected stands) indicate extremely cold winter temperatures during 1978 (Table 1). Far below-normal temperatures were recorded for the months of December 1978 and January-February, 1979. These cold temperatures may have been responsible for the needle necrosis noted the following spring. Late spring frosts may also have been involved in causing damage.

Many damaged trees displayed symptoms characteristic of winter drying (Fig. 3). Damage due to winter drying usually occurs during midwinter or early spring. After a period of cold weather, sudden increases in temperature accompanied by drying winds may cause excessive loss of water from tree foliage. This moisture often cannot be replaced because the soil moisture is either frozen or too cold and not available to the roots. Injury then results from desiccation. Classic symptoms of this type of damage include healthy, green foliage at the base of affected trees and reddened, necrotic foliage above (Fig. 3).

Reddening of foliage on the Pine Ridge trees was general over the entire crown. Longitudinal bark cracking was also associated with foliage symptoms. These cracks may have been due to rapid thawing of outer wood layers while the inner layers were still frozen (3).

Unfortunately, little can be done to prevent winter damage to existing trees. Hopefully, a majority of the affected trees will recover and exhibit normal growth.

Probably the greatest impact of weather-related damage is predisposition of trees to attack by insects and pathogens. Weakened trees are usually more susceptible to these biotic pest agents (1, 2, 4). An effective program of removing recently-killed trees may reduce chances for buildup of pests and subsequent damage to nearby healthy trees.

TABLE 1. Temperature data for the winter of 1978-79 at Rapid City, South Dakota (Sioux San Station).

Month/Year	Average Temperature ^{o}C	Departure from Normal ^{o}C
Sept. 1978	18.6	+ 2.2
Oct. 1978	10.7	- 0.1
Nov. 1978	- 0.6	- 3.5
Dec. 1978	- 6.7	- 5.1
Jan. 1979	- 12.8	- 8.6
Feb. 1979	- 6.5	- 4.3
Mar. 1979	2.6	+ 2.2

FIGURE 3. Ponderosa pine tree exhibiting winter drying symptomatology on the Bessey Ranger District, Nebraska National Forest.

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